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BIG SIOUX RIVER DRAINAGE BASIN. A COOPERATIVE STATE-FEDERAL REPORT ON WATER POLLUTION

Public Health Service
Kansas City, Missouri

October 1951

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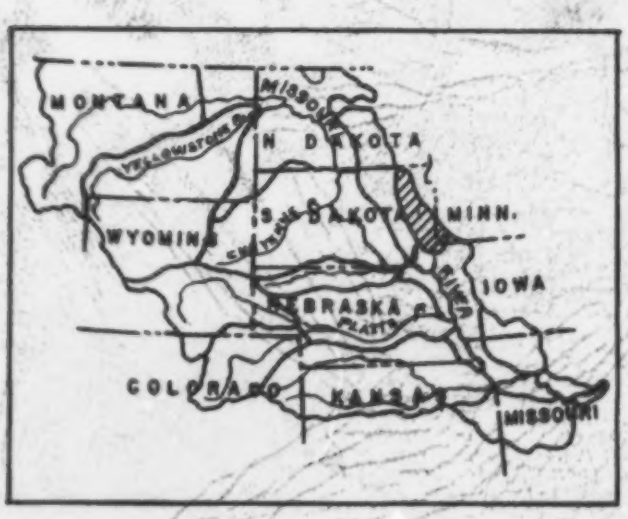
For Clean Water — "One River, One Plan"

Big Sioux River
DRAINAGE BASIN

A COOPERATIVE STATE-FEDERAL REPORT ON WATER POLLUTION

OCTOBER 1951



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A REPORT OF

WATER POLLUTION

IN

THE BIG SIOUX BASIN

Prepared by

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Division of Water Pollution Control
Missouri Drainage Basin

Details of illustrations in
this document may be better
studied on microfiche.

Federal Security Agency
Public Health Service
OCTOBER 1951

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INTRODUCTION

The Federal Water Pollution Control Act, Public Law 845, passed by the 80th Congress in June 1948, requires the Surgeon General of the Public Health Service to cooperate with other Federal agencies, with State and interstate water pollution control agencies, and with municipalities and industries in the preparation or adoption of comprehensive programs for eliminating or reducing the pollution of interstate waters and tributaries thereof, and improving the sanitary condition of surface and underground waters.

In developing these programs, due regard must be given to improvements necessary to conserve the nation's waters for public water supplies, propagation of fish and aquatic life, recreational purposes, agricultural and other legitimate uses.

Recognizing that full technical information was not available to permit development of such comprehensive programs immediately for most of the nation's waters, the Public Health Service envisioned the preparation of a series of reports to cover the period prior to adoption of comprehensive water pollution control programs. The first of these were the Summary Reports which were prepared for the 15 major drainage basins of the country on the basis of information readily available as of July 1, 1950. The second group of reports, of which this is one, covers the several sub-basins of the country's major drainage area. Since development of comprehensive water pollution control programs must proceed as rapidly as conditions permit, only a limited number of sub-basin reports are to be completed, and the majority of these will be for interstate sub-basins. This report is based on data available as of July 1, 1951, and will provide a reference point for measuring progress, provide a guide to needed additional data, provide a basis for the logical development of comprehensive programs, and serve to inform the public on the water pollution control problem and needs for the sub-basin concerned.

The data on which this sub-basin report is predicated have been compiled through and in cooperation with the State water pollution control agencies. It should not be considered a detailed engineering investigation of the Big Sioux Basin. Through these cooperating agencies additional data have been obtained from other State officials, county and city officials, and representatives of industry. Federal agencies also have been of great assistance.

The sub-basin reports present information about water use of the area, pollution entering those water resources and resulting damages, benefits which may result from pollution prevention and abatement, pollution prevention measures now in effect and those which appear to be needed.

Since this report is founded on data which are presently available, only limited discussion has been given present and future best uses of the waters of the sub-basin as related to pollution control. More detailed considerations will be included as a part of the comprehensive water pollution control programs to be adopted later.

Data and knowledge now available are sufficient to permit immediate solution of most of the pollution problems within the Big Sioux River Basin without awaiting results of additional surveys and studies.

A sincere effort has been made to present a fair picture of the complex water pollution problems in the Big Sioux Basin and to present reasonable conclusions and recommendations. It is our hope that this report, as a step in the cooperative development of an ultimate comprehensive water pollution control program, will help in safeguarding the water resources of the Basin.

ACKNOWLEDGMENT

This report has been prepared in cooperation with the South Dakota State Department of Health, the Iowa State Department of Health, and the Minnesota State Department of Health. This opportunity is taken to thank these agencies for factual data on sewage treatment facilities and sanitary conditions in the Big Sioux River and tributaries, and for their critical review of, and concurrence in, this report. Likewise, acknowledgment with thanks is made to the Corps of Engineers, Department of Defense; and to the Bureau of Reclamation, Fish and Wildlife Service, and the National Park Service, Department of Interior, for their review of the report and for the information gleaned from their published reports. Acknowledgment is also made of information concerning stream discharges extracted from published reports of the Geological Survey, Department of Interior.

SUMMARY

The Big Sioux Basin, located in eastern South Dakota, northwestern Iowa, and southwestern Minnesota, is a rich agricultural area whose residents depend almost entirely upon agriculture and associated industries for a livelihood. The population of rural areas has remained almost static for a period of approximately 50 years, however growth of the cities, particularly those having 2,500 people and more, has been rapid and continuous. The present population is estimated at 300,000.

The Big Sioux River and its principal tributary, the Rock River, form the drainage system of the Basin. The streams are utilized for municipal and industrial water supply, waste disposal, power, irrigation, livestock watering, recreation, bathing, game fishing, maintenance of lake levels, and support of fish and wildlife.

A high degree of sewage treatment generally prevails throughout the Big Sioux River drainage area. The problems of pollution were recognized at an early date by both state and municipal governments, and a great deal of effort has been put forth in the past 30 years to bring about corrections. Pollution below larger municipalities is serious because of the large amount of wastes from food processing establishments, the considerable volumes of domestic sewage, and frequent periods of critical low flow.

Industrial wastes originate largely in packing houses located in Sioux Falls and Watertown, South Dakota. Other sources of industrial wastes include creameries, local slaughtering houses serving locker plants, and dead animal rendering works.

Stream and lake pollution can be corrected by expanding or replacing existing sewage treatment facilities, elevating the general standard of sewage treatment plant operation, and constructing treatment works at municipalities and industrial installations where none now exist. The cost of providing adequate waste treatment facilities is estimated at $2,500,000.

Past and present pollution in the Big Sioux River system has had the effect of de-evaluating streams as sources of livestock watering, for recreational and fishing purposes, as a medium for fish and wildlife propagation, and as a source of industrial water supply. There have also been adverse effects on the public water supply taken from the stream at Flandreau, South Dakota. Land along streams where heavy pollution is evident has depreciated in value. In some instances the value of such lands has been restored by institution of sewage treatment.

The Big Sioux and its major tributary, the Rock River, are both interstate streams. While pollution of interstate waters is evident, it has not in the past posed a major problem.

Analysis of data contained in tables 5 and 6 indicates 36 municipalities and 7 industries* are sources of pollution. Six municipalities and two industries discharge untreated wastes which represent about 3.5 percent of the total organic population equivalents of pollution originating in the Basin. Although the ratio of treatment plants to sewer systems is unusually high (81%) many of the existing plants are incapable of sufficient treatment to produce effluents which are inocuous to the receiving streams. Only 16 of the 30 municipal works are reported to have adequate treatment capacity. Four of the five industrial waste treating plants are equipped with adequate facilities.

Data indicate that wastes as finally discharged into streams, including both raw and treated, approximate that from 54,000 people. Of this amount 50,000 is attributed to municipal sources. Prior to treatment, domestic and industrial organic wastes approximate 399,000 population equivalents, 296,500 of which are from industrial sources and 102,500 from domestic sources. Treatment removes approximately 86 percent of the pollutional material.

Table 1, page 4, lists municipalities and industries where new plants or other pollution abatement measures are needed. Surveys of most of the sources of pollution in the Big Sioux Basin have been made by the State water pollution control agencies and reports, containing findings of the investigations together with recommendations for correcting or improving conditions, have been provided municipal and industrial officials and other interested parties. State reports are available for public inspection. The State water pollution control agencies have further cooperated with representatives of numerous industries and municipalities through conferences regarding specific problems of pollution, and have worked closely

*Includes only industries having separate waste outlets.

Table 1. Big Sioux River Basin - Municipalities and industries needing improvements for abatement of pollution - March 1951

Name and location	Population served	Improvements needed 3/
Minnesota		
Adrian	975	Additional units (Secondary)
Jasper		
Creamery & Meat Market	150 1/	New plant or other control measures (Secondary)
Lake Benton	900	Additional units (Secondary)
Luverne	2,000 2/	New plant (Secondary)
Pipestone	5,276	Enlargement (Secondary)
Iowa		
Akron 4/	1,000	New plant
Ashton	450	New plant (Secondary)
Doon	400	Additional units (Secondary)
George	700	Replacement (Secondary)
Hawarden 4/	2,600	New plant
Hull	1,100	Replacement (Secondary)
Rock Rapids	1,890	New plant (Secondary)
Rock Valley	1,000	Enlargement (Secondary)
Sibley	1,400	Enlargement (Secondary)
South Dakota		
Brookings	5,310	New plant (Secondary)
Canton	2,000	New plant (Secondary)
Clear Lake	600	Additional units (Secondary)
Madison	5,025	New plant (Secondary)
Sioux Falls	45,000 2/	Enlargement (Tertiary)
Sioux Falls Rendering Co.	1,075 1/	Additional units (Secondary)
Watertown	10,245 2/	Enlargement (Secondary)
Watertown Abbatoir	2,000 1/	New plant needed (Secondary)
Webster	2,500	Enlargement (Secondary)

1/ Population equivalent (P.E.) of organic industrial waste produced.
2/ Figure does not include industrial waste population equivalent of organic material contributed thru municipal sewers.
3/ As tentatively outlined by the State water pollution control agency having jurisdiction.
4/ Degree of treatment not yet determined.

with engineers officially employed by municipalities and industries to study pollution problems. Numerous engineering studies have been made in the Big Sioux Basin and, while some were made sometime ago, they generally substantiate treatment needs as indicated by this report.

Flow in most of the streams of the Big Sioux Basin is quite erratic. During prolonged drough/periods most tributaries and portions of the Big Sioux itself have been completely dry. These periodic low flows contribute to the need for a high degree of waste treatment throughout the Basin.

CONCLUSIONS

The following conclusions regarding present, and probable future of, pollution and pollution abatement in the Big Sioux Basin are presented:

1. The Big Sioux Drainage Basin is likely to grow in population during the next two decades, primarily because of increased food processing activities in the industrial centers. The food processing industry will receive stimulus from a greater production of grain, hogs, cattle, milk, and other farm products resulting from the pending development of a large irrigation project in the adjacent James River Basin. It is apparent that wastes from both domestic and industrial sources will increase in quantity.

2. A uniform policy by the three States regarding pollution abatement requirements in the Big Sioux Basin is desirable. Such a policy would strengthen the Basin-wide approach to adequate water pollution control.

3. Continued surveillance of treatment works and the physical, biological, and chemical condition of the Big Sioux River and its tributaries is essential for proper stream pollution control.

4. There is need for eight* new municipal sewage treatment plants, enlargements or additions to 10 existing treatment works, and replacement of 2 plants. Two new treatment works and improvements to one existing treatment plant are indicated at three sources of industrial wastes. These new plants and improvements to existing plants are necessary even though data indicate that existing treatment works remove approximately 86 percent of the pollution originating within the Basin.

5. The operation of sewage treatment works is a vital phase of a pollution abatement program. Proper operation of existing treatment works is as important as the building of new plants or physical improvements to existing plants. Table 9, page 19, indicates that 9 of the 30 existing municipal sewage treatment works do not receive satisfactory operation.

6. Low stream discharges in the Big Sioux River and its tributaries

*Two of the eight new plants would be built in towns previously provided with sewage treatment.

induce added sewage treatment problems. While several growing communities have treatment works offering a high degree of treatment, increasing difficulty is being experienced in the maintenance of wholesome stream conditions when flows cease or become very low.

7. A water resources development program insuring sustained stream flows of moderate magnitude in the Big Sioux River from above Watertown, South Dakota, to the mouth, would have considerable value to communities located on the main stem for purposes of water supply and sanitation. A stabilized flow would also be beneficial for production of hydroelectric power, and would provide incidental benefits to recreation and fish and wildlife propagation.

8. Thirty-six municipalities lying within the Big Sioux Drainage Basin provide municipal sewage collection services for 102,500 people and for industries producing wastes equivalent in organic content to that from an additional 292,000 people. Seven industries have private sewage outlets and produce organic wastes equivalent to that from 3,700 people. Six municipalities and two industries discharge untreated wastes.

RECOMMENDATIONS

It is recommended that:

1. Cities discharging untreated wastes into the Big Sioux River or its tributaries install sewage treatment as soon as possible. Specifically, these are: Luverne, Minnesota; Akron, Ashton, Hawarden, and Rock Rapids, Iowa; and Canton, South Dakota. Treatment works should conform with plans and specifications as approved by the appropriate State water pollution control agency.

2. The Cities of Adrian, Lake Benton, and Pipestone, Minnesota; Doon, George, Hull, Rock Valley, and Sibley, Iowa; Brookings, Clear Lake, Madison, Sioux Falls, Watertown, and Webster, South Dakota, provide the improvement, replacement, or new construction necessary to safeguard stream water quality and correct present pollutional conditions.

3. The industrial operations at Jasper, Minnesota, the Sioux Falls Rendering Company at Sioux Falls, South Dakota, and the Watertown abattoir at Watertown, South Dakota, provide necessary measures to alleviate pollution from their respective operations.

4. The States of Iowa, South Dakota, and Minnesota jointly determine the degree of sewage treatment and standards of operation necessary to safeguard the beneficial uses of waters of the Big Sioux River and its tributaries.

5. The removal of excessive pollution be accorded high priority importance by appropriate State and Federal planning agencies. State water pollution control agencies should prepare and adopt comprehensive

stream pollution abatement programs for integration in any proposed water resources developments in the Big Sioux River Basin.

6. Following installation of recommended sewage treatment projects, studies be continued on streams in the Basin to evaluate effects and changes occurring in the river in relation to its use for bathing, domestic water supply, fish and wildlife propagation, irrigation, cooling water, livestock watering, ice harvesting, and other legitimate uses.

7. Proper cognizance of the problem of sewage treatment works operation be given by State legislators and municipal authorities to insure adequate operation of such facilities.

8. Federal agencies primarily responsible for the planning and construction of multipurpose water resource development projects in the Missouri Basin include in their planning, as a primary objective, the needs and benefits of assured minimum stream flow in the Big Sioux River for municipal and industrial water supply and stream sanitation. Water resources development studies should include the possibility of importation of water from adjacent watersheds.

GENERAL DESCRIPTION

Historical Background

The Big Sioux River was called the Wakpa-Ipoktan, meaning "Wooded River," by the Dakota Sioux Indians who formerly roamed the prairies of this region. Here also was the home of an ancient mound-building people, and evidence of these structures can be found over most of the Big Sioux Valley. In 1851 the Big Sioux River figured in the Traverse de Sioux Treaty, in which all land lying east of the river was deeded by the Indians to the United States Government. In 1859 all land lying between the Big Sioux and Missouri Rivers was ceded to the United States Government.

The early settlement at Sioux Falls was made in 1858 by the Western Town Company of Dubuque, Iowa. The rapids in the river attracted early pioneers, who began at once to utilize them for power purposes. A water-powered flour mill was constructed there in 1871. Fertile soils attracted farmers of Illinois, Indiana, and Ohio, who began moving into the Basin in large numbers following the Civil War. By 1900 the Basin had been completely settled and towns and cities established.

Physical Description

The Big Sioux River rises in northeastern South Dakota and flows generally southward to join the Missouri River near Sioux City, Iowa. The lower one-third of the river forms the boundary between Iowa and South Dakota. The Big Sioux is approximately 400 miles long; the Basin is from 50 to 80 miles wide and has an area of 9,415 square miles. Rock River, its principal tributary, rises in southwestern Minnesota and flows in a south-

westerly direction across northwestern Iowa to its confluence with the Big Sioux at a point approximately 10 miles north of Hawarden, Iowa. Its drainage basin contains 1,645 square miles.

The upper half of the Big Sioux Basin is typical prairie country with a few areas of hilly or gently sloping benchland. The lower half is characterized by its well-defined valley and alluvial bottom lands with surrounding hills rising abruptly from the valley floor to tablelands on either side.

The Big Sioux channel slopes from two to three feet per mile, and tributary channels slope considerably more. The channel is stable, but follows a very meandering course through the valley.

The topographic and climatological conditions prevailing in the Basin make it admirably suited for livestock and grain production. The mean normal precipitation averages 26.4 inches. The temperature averages 44.7° and varies between -42° F. and 110° F.

The average annual river discharge for the period of record is 594 c.f.s. as measured at Akron, Iowa. Daily flows at this point, however, vary between a recorded minimum of 7 c.f.s. on February 26 to 28, 1936, to a maximum of 21,400 c.f.s. on June 4, 1942. An analysis of the discharge characteristics of the Big Sioux River as recorded at Akron, Iowa, indicates that critical low flows are more apt to occur in winter months, probably because of heavy ice.

While several other gaging stations have been established, both on the main stem and on tributary streams, their periods of record are very brief and therefore inconclusive as to frequencies of low stream discharges. An analysis of available flow data is included in table 12, appendix A. At numerous points of significant pollution in the upper reaches of the stream, flows are known to approach zero quite frequently. In general this is true for all points above the Sioux Falls and Luverne gaging stations.

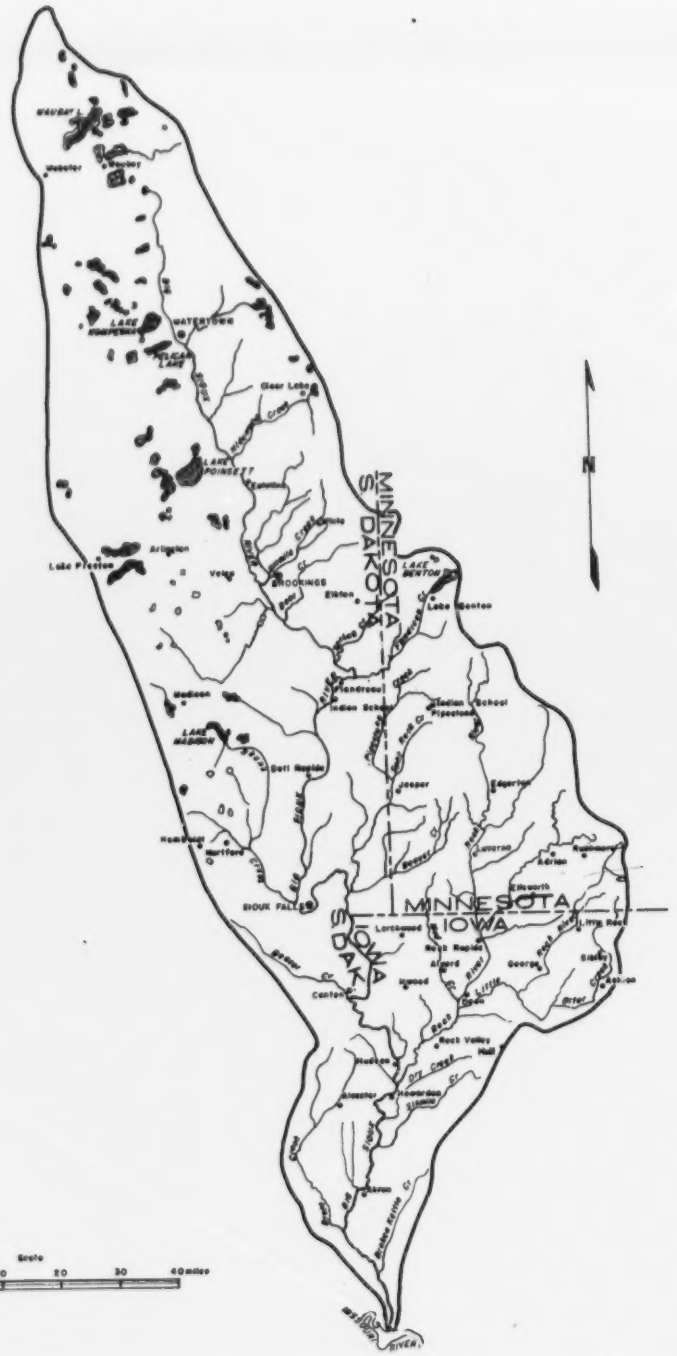
There was, at one time, a total of 11 low head dams in the Big Sioux River and its major tributary, the Rock River. These dams were used for power and diversion purposes. While all power developments except the one at Sioux Falls have since been abandoned, several of the dams are still in existence and afford recreational facilities.

Economic Development

About 98 percent of the area is cultivated and 60 percent of the population is engaged in agriculture, the most important source of livelihood. Urban* areas represent about 40 percent of the total population, and include 2 cities of more than 10,000. The present total population is estimated at 300,000 persons, exclusive of Sioux City, Iowa. Table 2 lists community populations for 1920, 1930, 1940, and 1950.

The Big Sioux Basin was developed during the period immediately following the Civil War. It grew rapidly in population until the early 1900s. Since that time the rural population has been static. The larger cities and towns have experienced considerable growth, which is continuing. Of these cities Sioux Falls is the largest. A study of the growth of population in the Big Sioux Basin indicates that it has been continuously upward.

*Includes towns, villages, and cities of more than 250 inhabitants.



BIG SIOUX RIVER BASIN LOCATION MAP

BIG SIOUX RIVER BASIN

GENERAL REFERENCE MAP

FEDERAL SECURITY AGENCY
Public Health Service
DIVISION OF WATER POLLUTION CONTROL
MAP NO. 1

During the period 1930 to 1940 when the State of South Dakota lost approximately 7.2 percent of its population, a gain of 1.5 percent was registered in the Basin.

The meat packing industry is of great economic importance to the Basin. Large plants are located at Sioux Falls and Watertown, South Dakota. Smaller abattoirs and locker plants are located in most of the smaller cities and towns.

No mineral resources of note have been located, although building stone of good quality is quarried near Sioux Falls and Dell Rapids in South Dakota.

Considerable growth of industry, supported by increased agricultural activities as a result of the opening of new irrigation projects now under consideration in the adjacent James River Basin, is anticipated.

The general income level of inhabitants of the Basin is above the national average, and is expected to continue slightly above that average for many years to come.

USES OF WATER RESOURCES

The waters of the Big Sioux River are utilized for numerous purposes, including development of power, irrigation, livestock watering, recreation, bathing, game fishing, cooling water for industrial plants, maintenance of the level of several lakes in the upper portion of the Basin, fish and wildlife propagation, municipal water supply, removal and ultimate disposal of sewage and industrial wastes.

The Flandreau Indian School uses river water for its domestic system, and Watertown, South Dakota, secures its supply from Lake Kampeska. All other cities and towns derive water from ground sources. Ground water for the most part is highly mineralized, and in some instances limited in quantity. The ever increasing consumption of water taken from a limited underground supply is cause for concern, particularly at Sioux Falls, South Dakota. Table 3 summarizes surface water supply data, and table 4 summarizes ground water supply data. Four permits have been issued for use of water for irrigation near Sioux Falls, and one has been granted the State Game Commission to divert water from the Big Sioux into Lake Poinsett. One permit has been issued to Sioux City Gas and Electric Company, Sioux City, Iowa, for cooling water use. Permits for water use in South Dakota are issued by the State Engineer.

There is no commercial fishing in the stream with exception of a so-called turtle farm of small income located near Brookings, South Dakota. Considerable sport fishing is carried on along the Big Sioux. Fishing is popular in the headwaters of the Big Sioux and Rock Rivers, and in the Big Sioux from its junction with the Missouri to the mouth of the Rock River. An annual value of $12,300* has been placed on a relatively small portion

*Fish and Wildlife Service "A Preliminary Evaluation Report on Fish and Wildlife Resources in Relation to the Flood Control Plan for the Big Sioux River."

Table 2. Big Sioux River Basin - Population of cities*

Municipality	Population - U. S. Census			
	1920	1930	1940	1950
South Dakota				
Alcester	492	460	581	585
Arlington	1,011	1,020	1,157	1,090
Brookings	3,924	4,376	5,346	7,730
Canton	2,225	2,270	2,518	2,532
Castlewood	582	500	493	-
Clear Lake	835	834	997	1,106
Colman	535	488	462	-
Dell Rapids	1,667	1,657	1,706	1,650
Hagan	569	419	418	347
Elkton	872	856	779	657
Estelline	658	488	627	760
Flandreau	1,929	1,934	2,212	2,197
Garretson	715	655	666	745
Gary	588	543	566	558
Hartford	677	628	647	592
Hayti	293	344	370	413
Hudson	470	478	478	500
Humboldt	445	428	417	450
Jefferson	550	426	469	466
Lake Norden	408	459	463	373
Lake Preston	1,008	944	886	957
Madison	4,144	4,289	5,018	5,142
Sioux Falls	25,202	33,362	40,832	53,746
Volga	600	604	632	578
Watertown	9,400	10,214	10,617	12,662
Waubay	979	903	992	879
Webster	1,800	1,805	2,173	2,506
White	594	533	559	525
Iowa				
Akron	1,324	1,304	1,314	1,252
Alvord	359	313	306	263
Ashton	610	568	620	588
Doon	576	576	576	517
George	788	907	1,107	1,210
Hawarden	2,491	2,459	2,681	2,628
Hull	-	-	1,100	1,134
Inwood	746	670	634	644
Ireton	730	612	653	573
Larchwood	441	382	405	415
Little Rock	573	585	633	533
Rock Rapids	2,172	2,221	2,556	2,668
Rock Valley	1,347	1,204	1,507	1,576
Sibley	1,803	1,870	2,356	2,546
Minnesota**				
Adrian	1,087	1,000	1,066	1,115
Edgerton	657	627	815	-
Ellsworth	667	644	660	-
Jasper	968	769	880	-
Lake Benton	944	903	961	-
Luverne	2,782	2,644	3,114	3,657
Pipestone	3,325	3,489	4,682	5,256
Rushmore	313	332	423	-

*Includes cities and towns of 250 people or more.

**1950 census available only for cities of 1,000 or more inhabitants.

of the river system. This value would undoubtedly be greater if the entire system were to be evaluated. Fish taken include channel catfish, bull heads, yellow pike, fresh water drum, and carp. Local people make up the bulk of the fishermen. The ready availability of the river for fishing is highly important to the factory worker or farmer who has only a brief period in which to enjoy the sport and must therefore find it near his home. The Big Sioux River is not used for navigation, although considerable interest has been manifested in developing a boat harbor at the confluence of the Big Sioux and Missouri Rivers.

The presence of a number of low head dams in the Big Sioux River has greatly enhanced its value for swimming and as an aesthetic aid to parks and picnic areas. The value of clean water for these purposes is great. At least five different stream reaches of the Big Sioux River are supplying these recreational needs.

The Big Sioux and its tributaries are extensively used for stock watering.

There is the possibility that in the future it will be necessary to use the Big Sioux River as a source of water supply for one or more municipalities. Such development is contingent upon a regulated flow sufficient to insure a year-round supply. This would be of appreciable monetary value to communities and industries as an alternate source of water, and as an alternate for an extremely high degree of sewage treatment. An increase in minimal flows would also bring about benefits to fish and wildlife resources, produce added hydroelectric power, and provide more and better recreational facilities.

Map No. 6 illustrates pictorially surface water uses in the Big Sioux River Basin.

Table 3. Big Sioux River Basin - Municipal surface water supplies

Municipality	State	Miles above mouth: Big Sioux River	Miles above mouth: Tributary	Treatment (1)	Population served	Average consumption M. G. D.
Watertown	S. D.	228.0	(Lake Kampeska)	AFD	10,245	1.000
Flandreau Indian School	S. D.	203.0		AFD	750(est)	0.075

(1) Treatment - A - Aeration
F - Coagulated, Settled, Filtered
D - Chlorinated

Table 4. Big Sioux River Basin - Municipal water supplies from ground sources

Municipality	Source (1)	Treatment (2)	Estimated population served	Average consumption M. G. D.
Iowa				
Akron	DW	N	980	0.04
Alvord	DW	N	290	0.057
Ashton	SW	N	320	0.028
Doon	DW	N	550	0.018
George	SW	D	1,000	0.10
Hawarden	DW	N	2,100	0.16
Hull	DW	N	1,100	0.015
Inwood	DW	N	480	0.02
Ireton	DW	N	400	0.025
Larchwood	DW	N	385	0.03
Little Rock	DW	N	500	0.05
Rock Rapids	DW	N	2,250	0.20
Rock Valley	DW	N	1,100	0.08
Sibley	DW	N	1,900	0.12
Minnesota				
Adrian	SW	N	1,220	0.015
Edgerton	DW	N	610	0.024
Ellsworth	DW	N	180	0.007
Jasper	SP	D	880	0.03
Lake Benton	DW	N	700	0.12
Luverne	DW	DIA	3,110	0.20
Pipestone	DW	N	4,682	0.285
South Dakota				
Alcester	DW	N	580	0.018
Arlington	DW	N	1,000	0.06
Brookings	W	AIF	5,310	0.65
Bryant	DW	N	450	0.015
Canton	DASW	N	2,140	0.20
Castlewood	SW	N	370	0.02
Clear Lake	DW	N	750	0.06
Colman	DW	N	425	-
Dell Rapids	DW	N(D)	1,620	0.125
Egan	SW	N	400	-
Elkton	SW	N	515	0.03
Estelline	DW	N	470	0.045
Flandreau	DASW	N	2,200	0.20
Garretson	DW	N	635	0.03
Gary	SW	N	340	0.075
Hartford	DW	N	580	0.075
Hudson	DW	N	475	0.036
Humboldt	DW	N	400	-
Jefferson	W	AIF	495	0.03
Lake Norden	SW	N	460	0.02
Lake Preston	DW	N	795	0.110
Madison	SW	D	4,300	0.43
Roslyn	W	N	250	-
Sioux Falls	SW	AIF	41,000	4.0
Waubay	DW	N	715	0.06
Webster	DW	N	1,740	0.25
Wentworth	DASW	N	200	-
White	DW	N	360	0.02

(1) Source - W - Wells
SW - Shallow Wells
DW - Deep Wells

(2) Treatment - N - None
D - Chlorinated
F - Coagulated, Settled, Filtered
I - Iron Removal
A - Aerated

POLLUTION CONTRIBUTED TO WATER RESOURCES

There are 13 cities and towns of more than 300 inhabitants in the Iowa portion of the Big Sioux River Basin. Eleven municipalities have sewage collection systems and seven of the sewered communities have sewage treatment works. Approximately 11,300 people are provided sewer service. In addition, industrial wastes equivalent to that produced by a population of 2,800 people are also collected by municipal sewer systems. About 24 percent of the combined sewage and industrial waste is removed by treatment prior to its discharge into streams.

There are eight cities and towns having a population of 300 or more inhabitants in the Minnesota section of the Basin. Seven communities have sewage collection systems only one of which does not have a sewage treatment plant. Municipal sewage collection systems serve a population estimated at 11,100 people, and receive industrial waste equivalent to an additional 4,500 people. Three industries having private waste outlets contribute waste estimated to be equivalent to that from about 400 people. An estimated 45 percent of the waste originating in Minnesota is removed by treatment prior to its discharge into watercourses.

Twenty-eight cities and towns having 300 inhabitants or more are located in the South Dakota portion of the Big Sioux Basin. Eighteen of these have sewage collection facilities; 17 of the 18 are equipped with sewage treatment works. Municipal sewage collection systems serve about 80,000 people and industries which contribute waste equivalent to that from about 285,000 people. Four industries having private waste outlets contribute pollution equivalent to about 3,300 people. Sewage treatment facilities in South Dakota remove an estimated 90 percent of the original polluting material prior to discharge of the waste into streams. This substantial reduction is primarily due to the very high degree of treatment which is obtained in the Sioux Falls, South Dakota, sewage treatment plant.

Present treatment facilities remove an estimated 86 percent of the polluting material originating within the Basin. Maps No. 2 and 3 indicate the location of significant municipal and industrial sources of pollution.

Industrial pollution far outweighs domestic pollution in this area. Tables 5 and 6 contain data which show that the organic population equivalents of industrial waste prior to treatment is approximately 3.5 times as great as that from the domestic population.

Approximately 96 percent of the industrial waste of the Basin is produced in Sioux Falls and Watertown, South Dakota. About 50 percent of the urban* population is also located in these two cities and Brookings, South Dakota. These cities, by virtue of their industry and population, are the principal sources of pollution. The Cities of Luverne, Minnesota; Akron, Ashton, Hawarden, and Rock Rapids, Iowa, and Canton, South Dakota, have no sewage treatment facilities and at present are discharging raw sewage. Untreated waste from these six municipalities and the industries at Jasper, Minnesota, and Watertown, South Dakota, amount to approximately three percent of all waste.

*Includes towns of 300 people or more.

Table 5. Big Sioux River Basin - Basic data on sources of municipal pollution

Name and location of municipality	Sewered population P. E.	Estimated untreated waste P. E.	Treatment provided	Adequacy of treatment: Capacity	Adequacy of treatment: Operation	P.E. discharged (est.)	Treatment needs	Community action
Lake Area								
Volga, S.D.	2,500	2,500	Secondary	Unsatis.	Satisfactory	1,600	R	Preliminary planning
Wenona, S.D.	300	300	Primary	Satisf.	Satisfactory	225	-	
Big Sioux River								
Watertown, S.D.	10,845	29,845	Secondary	Unsatisf.	Satisfactory	4,770	R	Inactive
Bidwood Creek								
Clear Lake, S.D.	600	600	Secondary	Unsatisf.	Unknown	240	A	Final plans approved
Estelline, S.D.	550	550	Primary	Satisf.	Satisfactory	430	-	
Lake Area								
Arlington, S.D.	1,060	1,060	Secondary	Satisf.	Unknown	400	-	
Big Sioux River								
Big Mile Creek								
White, S.D.	500	500	Secondary	Satisf.	Satisfactory	100	-	
Brookings, S.D.	5,310	5,310	Secondary	Unsatisf.	Satisfactory	2,400	NP	Inactive
Spring Creek								
Elkton, S.D.	450	450	Primary	Satisf.	Satisfactory	350	-	
Flandreau Creek								
Lake Benton, Minn.	900	1,070	Primary	Unsatisf.	Unsatisfactory	755	A	Inactive
Flandreau, S.D.	2,500	2,500	Secondary	Satisf.	Satisfactory	400	-	
Flandreau Indian School, S.D.	600	600	Secondary	Satisf.	Unknown	100	-	
Dell Rapids, S.D.	1,635	1,635	Secondary	Satisf.	Satisfactory	300	-	
Skunk Creek								
Madison, S.D.	5,025	5,025	Secondary	Unsatisf.	Satisfactory	2,000	NP	Inactive
Humboldt, S.D.	385	385	Secondary	Satisf.	Satisfactory	90	-	
Hartford, S.D.	645	645	Secondary	Satisf.	Satisfactory	200	-	
Sioux Falls, S.D.	45,000	311,200	Secondary	Unsatisf.	Satisfactory	15,000	R	Preliminary planning
Split Rock Creek								
Pipestone, Minn.	5,276	8,100	Secondary	Unsatisf.	Unsatisfactory	3,200	R	Inactive
Pipestone Indian School, Minn.	450	450	Secondary	Satisf.	Satisfactory	100	-	
Canton, S.D.	2,000	2,000	None	-	-	2,000	NP	Inactive
Rock River								
Edgerton, Minn.	850	1,100	Secondary	Satisf.	Satisfactory	440	-	
Luverne, Minn.	3,000	3,000	None	-	-	3,000	NP	Preliminary planning
Adrian, Minn.	975	1,125	Primary	Unsatisf.	Unsatisfactory	864	A	Inactive
Ellsworth, Minn.	623	770	Secondary	Satisf.	Satisfactory	120	-	
Rock Rapids, Iowa	1,890	3,100	None	-	-	3,100	NP	Preliminary planning
Doon, Iowa	400	400	Primary	Unsatisf.	Unsatisfactory	300	A	Inactive
Little Rock River								
Sibley, Iowa	1,400	8,500	Secondary	Unsatisf.	Unsatisfactory	650	R	Final plans approved
Ashton, Iowa	450	450	None	-	-	450	NP	Inactive
Little Rock, Iowa	400	400	Secondary	Satisf.	Satisfactory	150	-	
George, Iowa	700	700	Secondary	Unsatisf.	Unsatisfactory	400	R	Final plans approved
Hull, Iowa	1,100	1,100	Secondary	Unsatisf.	Unsatisfactory	500	R	Preliminary planning
Rock Valley, Iowa	1,000	1,400	Secondary	Unsatisf.	Unsatisfactory	1,200	R	Inactive
Inwood, Iowa	400	400	Secondary	Satisf.	Unsatisfactory	250	-	
Rewarden, Iowa	2,600	2,600	None	-	-	2,600	NP	Inactive
Akron, Iowa	1,000	1,100	None	-	-	1,100	NP	Inactive
Brule Creek								
Alcester, S.D.	550	550	Secondary	Satisf.	Satisfactory	110	-	

Note: NP - New plant
A or R - Additions or enlargements
R - Replacement

Table 6. Big Sioux River Basin - Basic data on sources of industrial pollution

Name and location	Type of industry	Type of waste produced	Treatment or other pollution control measures: Degree	Treatment or other pollution control measures: Adequacy	Population equivalent discharged to watercourse[1]	Pollution abatement measure needed	Project status
Big Sioux River							
Rendering Works (Watertown, S.D.)	Food and kindred products	Organic	Substantial	Adequate	200	None	
Abattoir (Watertown, S.D.)	*	Organic	None	Inadequate	2,000	New plant	Plans approved
Sioux Falls Rag Farm	*	Organic	Partial	Adequate	50	None	
Sioux Falls Rendering Co. (Sioux Falls, S.D.)	*	Organic	Partial	Inadequate	1,075	Addition	Plans approved
Split Rock Creek							
Jasper Creamery & Meat Market (Jasper, Minn.)	*	Organic	None	Inadequate	150	New plant or other control measures	Inactive
Rock River							
Edgerton Creamery	*	Organic	Substantial	Adequate	-	None	
Edgerton Rendering Works (Edgerton, Minn.)	*	Organic	Partial	Adequate	100	None	

[1] Expressed as organic population equivalents.

The schematic presentation, page 16, indicates the amount and relative location of each source of pollution in the Big Sioux River Basin.

DAMAGES TO WATER RESOURCES FROM POLLUTION

According to the 1937 report of the South Dakota State Department of Health on sanitary conditions in the Big Sioux River, pollution damage is significant. Deoxygenation of the stream below larger sources of pollution during low flow or heavy ice cover prevents successful fish propagation. Low-head dams in the river aid reaeration of the water; however in the summer a public health hazard is created when sewage contaminated reservoirs are used for bathing or other recreational purposes.

The coliform count (indicated number) in the river water above the Flandreau Dam, which is used extensively for swimming, was 380 organisms per 100 cc in 1937, which would place this area in a "B" classification according to recommended classifications of the Report of the Joint Committees on Bathing Places*. The number of organisms of the coliform group at the Hagan site was 700, which would establish it in a "C" classification according to the above-mentioned report. The count at the Dell Rapids Beach was 1,370, at Sherman Park in Sioux Falls 1,250, and at the Canton recreational area 3,025, which would classify these areas in the "D" group. Public health authorities recommend against the use of Class "D" waters for bathing. Further investigations as to the bacteriological qualities of the bathing waters have not taken place since that reported following the 1937 stream pollution survey of the Big Sioux River. Abatement of pollution would reduce the public health hazard associated with the use of these natural bathing sites.

There have been several lawsuits relative to water pollution in and below Sioux Falls during the past 30 years, the earliest of which resulted in construction of the present treatment works. Since the plant's construction, subsequent suits against the City of Sioux Falls have not been successful.

According to reports from the Public Health Engineering Division of the Iowa State Department of Health, moderate pollution exists in the Little Rock River below George, Iowa, below Rock Rapids on the Rock River, and below Ashton on Otter Creek, a tributary of the Little Rock River. Nuisance conditions prevail at times of low flows in Otter Creek below Sibley, Iowa.

The Minnesota State Health Department reports that tributary streams of the Big Sioux and Rock Rivers rising in Minnesota, used primarily for stock watering and fish and wildlife propagation, show little damage from moderate pollution.

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*1935 American Public Health Association and Conference of State Sanitary Engineers. Class "A" is considered good, Class "B" fair, Class "C" poor, and Class "D" very poor.

BENEFITS RESULTING FROM POLLUTION PREVENTION AND ABATEMENT

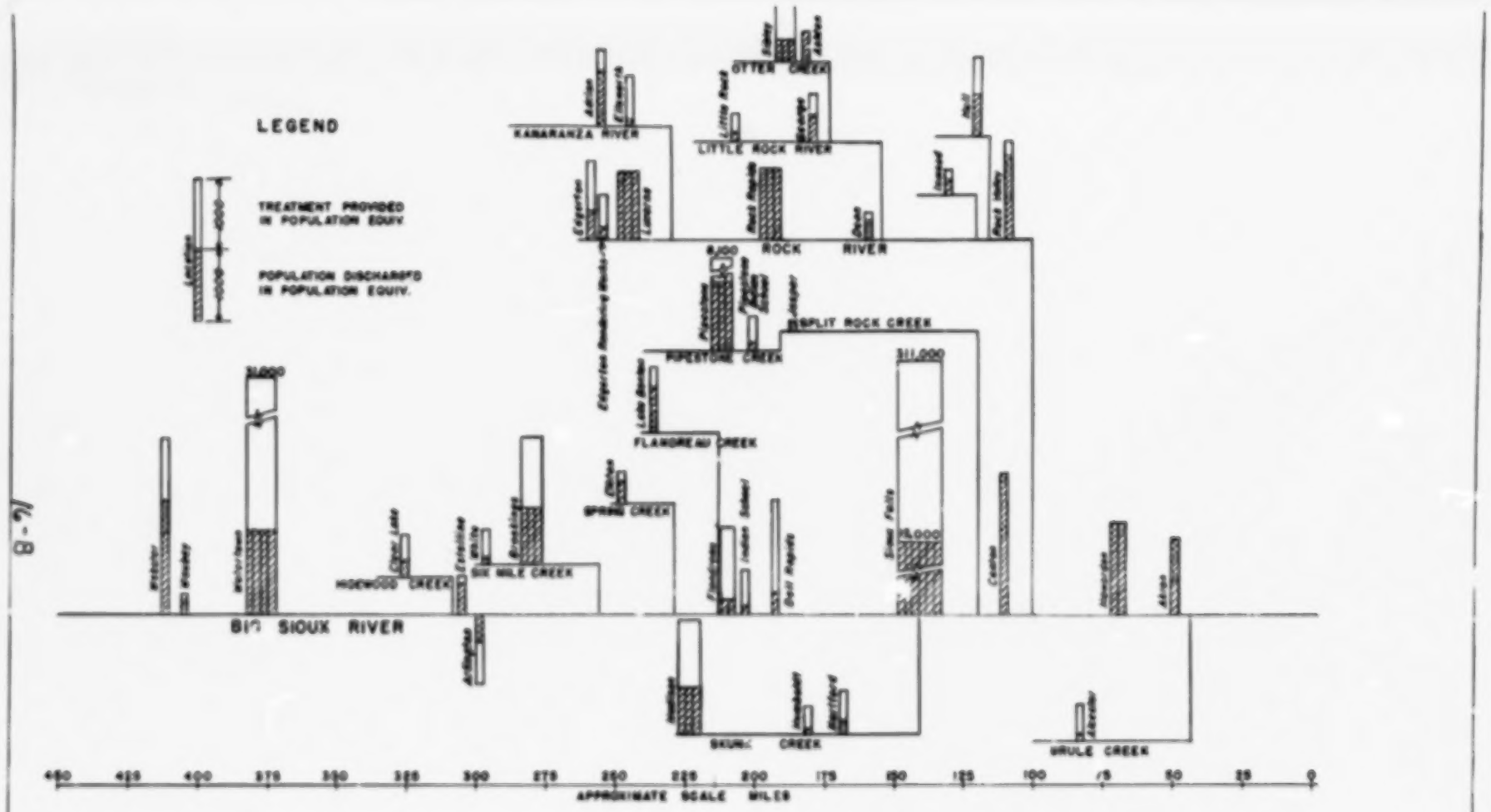
The meat packing industry at Sioux Falls, South Dakota, has, in an effort to reduce pollution, introduced programs of salvaging packing house wastes and has greatly increased the recovery of blood, grease, and other materials. While such recovery has tended to reduce the total sewage load, the reduction has, to a considerable extent, been offset by increased production. Blood, grease, and similar salvageable wastes have considerable value for livestock feed or industrial fats. During World War II salvaged grease was extremely important to the war effort and demands for it continue.

Intensive recreational usage is made of the Big Sioux River at Flandreau, Egan, Dell Rapids, Sioux Falls, Canton, and near Sioux City. Existing abatement works are not entirely adequate to protect the recreational utilization of these water resources. However, without existing abatement measures pollution would be so severe that recreational utilization in the vicinity of Flandreau, Dell Rapids, Sioux Falls, and Canton would at this time be nonexistent. Although it is exceedingly difficult to evaluate in monetary terms the worth of these recreational facilities, their current value may be entirely attributed to pollution abatement measures provided at or above these locations. From discussions with persons familiar with the area it seems reasonable to assign an annual value of $12,000 to recreational usage of that portion of the stream between Flandreau and Sioux Falls. While benefits undoubtedly accrue to other reaches of the stream, a basis for assigning values is not readily available.

Abatement measures carried out above Flandreau have improved the quality of water entering the water treatment plant at this location. This value, while significant, is difficult to express in monetary terms.

Prior to sewage treatment at Sioux Falls, pollution of the river below the city resulted in a deterioration of property values along the stream. Since treatment has been installed these property values have been restored.

There is evidence that pollution abatement measures already effected have resulted in substantially increased annual fishery values. For example, prior to development of existing abatement works, fishing is known to have been extremely poor and practically nonexistent in the Big Sioux River between Watertown, South Dakota, and the confluence of the Big Sioux and Rock Rivers. A report by the Missouri River Basin Studies Office, Fish and Wildlife Service, dated January 1950, states that fish commonly taken between Flandreau and the confluence of the Rock and Sioux Rivers, include bullheads, channel catfish, yellow pike, freshwater drum, and carp. This same report assigns a fishery value of $6,000 per year for the stretch between the mouth of the Big Sioux and the mouth of the Rock River. Also assigned are annual values of $1,800 between Sioux Falls and Baltic, South Dakota, and $4,500 between Flandreau, South Dakota, and Stray Horse Creek. These annual values totaling $12,300 may be presumed to have resulted from pollution abatement measures at Flandreau and Dell Rapids. Substantial values are also believed to exist in the main stem between Watertown and Flandreau, and along important tributaries in the three States. It is



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SCHEMATIC GRAPH
of
BIG SIOUX RIVER BASIN
showing
SOURCES OF POLLUTION
AND
POLLUTION DISCHARGED IN POPULATION EQUIVALENTS

FEDERAL SECURITY AGENCY – PUBLIC HEALTH SERVICE
DIVISION OF WATER POLLUTION CONTROL
MISSOURI DRAINAGE BASIN
FEB. 1951

believed that substantial fishery values have accrued in addition to those already discussed, and that the total of these values for the entire Basin will approach a magnitude three or four times those specifically indicated in the Fish and Wildlife Report covering only a portion of the Basin.

POLLUTION CONTROL MEASURES IN EFFECT

State water pollution control programs in effect in the Big Sioux Basin, while deficient in that not enough trained personnel have been available to make the extensive investigations and inspections needed, have been quite successful. They have followed the pattern of meeting as frequent as possible with responsible municipal and industrial officials, inspections, training of sewage plant operators, and stimulation of a desire on the part of the public for clean streams. Anthusiasm, technical competency, and personality of health department personnel have contributed much to the program. Little attempt has been made to use formal orders or legal action to secure abatement measures. The State Health Departments appear to have the respect of cities, industries, and the public in general, and this is of as much importance as legal authority granted by statute as far as accomplishment is concerned. Existing legislation, while not entirely adequate, is sufficiently strong to deal with recalcitrant cases. The influence of good laws is felt even though the legal machinery created thereby may seldom be called upon. An indication of the success of existing programs is that 30, or 83 percent of the 36 towns having sewer systems, have treatment plants. In South Dakota 94 percent of the towns having sewer systems also have treatment works. Comparable figures for Iowa and Minnesota sections of the Basin are 64 percent and 86 percent respectively. Present treatment facilities remove approximately 86 percent of the polluting material prior to its discharge into the streams.

The principal deterrent to water pollution control programs has been lack of appropriations, unfavorable salary scales and consequent excessive personnel turnover, and in recent years difficulties in securing well trained personnel. Increased appropriations by State legislatures for water pollution control work in Iowa, South Dakota, and Minnesota, coupled with grants-in-aid funds authorized by Federal stream pollution control legislation, have greatly increased the adequacy of water pollution control funds in recent years. It is important that the current level of funds be continued, as a stable, smooth-functioning pollution control organization can be built to serve the State only if adequate funds and personnel are provided.

There is in general a lack of legislation which will allow the State water pollution control agencies to enter into official compacts with other State groups, the Federal Government, or other organizations, for improvement of the general welfare of the people of the States affected. A penalty clause in the legislation of the State of South Dakota might also give impetus to the pollution abatement program.

The present legislation of the State of Iowa, enacted in 1949 and amended in 1951, considerably strengthens previous legislation, under which a large measure of progress was made. There is still need for legislation which will promote better operation of existing sewage treatment works.

The Minnesota statutes have provided an excellent working base for pollution control.

Appendix B contains a legal review of water pollution control legislation in the three States, as formulated by attorneys of the Federal Security Agency.

In general the people residing in the Big Sioux Basin are cognizant of the need to control pollution, and great strides have been made in the direction of such control. There remains, however, the need of a greater appreciation by the general public and municipal governing bodies for the operating difficulties encountered in a sewage treatment works. The mere construction of a modern sewage treatment works will by no means insure that stream pollution has been properly controlled. Well trained operators are of prime importance. In order to obtain such operators it is necessary to pay attractive wages, insure reasonable longevity of position, and provide adequate training. There has been a great tendency, particularly among municipal authorities, to regard sewage treatment plant operation as the most menial of tasks, when in reality it is one which requires a great deal of skill, intelligence, and training if the operation is to be carried out successfully. Comparable degrees of competency are required for maintenance and operation of a sewage treatment works as for water or electric utilities.

Financial limitations imposed by State laws in Iowa, Minnesota, and South Dakota apparently do not, at present, prevent construction or adequate operation of municipal treatment works.

Table 7 summarizes existing treatment facilities by degree of treatment offered. Table 8 summarizes the adequacy of the capacity and operation of plants.

While most sources of pollution in the Basin now receive treatment, relatively few improvements have been made in recent years. Table 9 indicates that two small municipalities and two industries completed new plants during the years 1946 through 1950. Additions to one large municipal plant were begun in 1950. Plans have been drawn for improvements at five municipalities and two industries.

Table 7. Big Sioux River Basin - Existing treatment facilities - Municipal

Degree of treatment provided	Number		Population served
	Municipalities*	Plants	
Primary	6	6	3,800
Secondary	24	24	88,800
No treatment	6	-	9,900
Total	36	30	102,500

*Includes incorporated or unincorporated municipalities, other legal bodies as sanitary districts, counties, towns, significant institutions, resorts, recreational centers or other population centers.

Table 8. Big Sioux River Basin - Adequacy of existing treatment facilities - Municipal and industrial

Existing treatment facilities	Number	Adequacy with relation to					
		Capacity			Operation		
		Satisf.	Unsatisf.	Undetermined	Satisf.	Unsatisf.	Undetermined
Municipal*	30	16	14	0	18	9	3
Industrial**	5	4	1	0	4	1	0

*Includes incorporated or unincorporated municipalities, other legal bodies as sanitary districts, counties, towns, significant institutions, resorts, recreational centers or other population centers.

**Industries having separate outlets discharging wastes directly to watercourse.

Table 9. Big Sioux River Basin - Progress in pollution abatement

Year	Municipal		Industrial	
	Plants completed	Design population	Plants completed	[1]Amount of waste treated (In terms of equivalent number of people)
1946	0	-	0	-
1947	0	-	1	3,000
1948	0	-	1	870
1949	1	800	0	-
1950	1	450	0	-

[1]Expressed as organic population equivalents.

POLLUTION PREVENTION MEASURES NEEDED

Present uses of water resources, and increased or additional uses possible in the future with improved water quality, must to a large extent determine pollution prevention measures needed. Also to be considered are riparian rights and protection of property values. Throughout the Big Sioux Basin the following concepts are generally recognized as desirable objectives by stream pollution control agencies.

1. Toxic substances must be precluded from streams to protect water supplies and to maintain a balanced aquatic life necessary for a productive fishery.

2. Effective removal of settleable and floating solids is necessary

as an absolute minimum to prevent sludge banks, floating material and nuisance conditions in the vicinity of sewer outlets. This is termed primary treatment, and is generally considered to remove about 35 percent of the Biochemical Oxygen Demand, a measure of oxygen required for the stabilization of pollution.

3. Additional treatment must be provided, where necessary, to maintain the oxygen level essential for a balanced aquatic life, to assure the bacterial quality desirable for municipal or recreational water supplies, to prevent nuisance conditions, or to reduce health hazards. The removal of Biochemical Oxygen Demand by biological methods is termed secondary treatment. Effective primary and secondary treatment in combination are generally considered to remove not less than 75 percent of the Biochemical Oxygen Demand.

The degree of treatment required beyond effective removal of settleable material is influenced by the amount of dilution water available during periods of critical low flow. In the Big Sioux Basin two separate and distinct critical periods occur: the first during summer conditions of low flow when high water temperature reduces the capacity of stream water to contain oxygen and at the same time accelerates the rate of biological activity with a corresponding increase in the rate of oxygen required; the second during winter conditions of low flow when severe and prolonged ice cover precludes reaeration of stream water. With ice cover all biological activity, while progressing at a lesser rate than during periods of warm water, must be wholly supported by oxygen contained in the receiving water prior to the discharge of pollution.

It is generally agreed that a minimum of 5.0 parts per million of dissolved oxygen is necessary in stream reaches of the Basin otherwise offering a suitable fishery habitat for the support of a balanced aquatic life. Because of limited dilution water during periods of low flow, secondary treatment, or removal of not less than 75 percent of the Biochemical Oxygen Demand, is required for most sources of pollution in the Basin. Where the quantity of waste is large, as in the principal towns where industry is concentrated, a degree of removal substantially in excess of 75 percent may be required to maintain desirable oxygen levels.

While definite standards relating to the bacteriological quality of water used as a source for water treatment plants have not been adopted in the Big Sioux Basin, maximum allowable concentrations contained in the Manual of Recommended Water Sanitation Practices (Public Health Service Bulletin #296, 1946) are generally used as one of the guides of administration of water pollution control programs. It is also generally accepted that water for recreation usage should be free from floating solids, sludge banks, odors, and discoloration. Standards recommended by the Joint Committee on Bathing Places (see footnote, page 18), together with sanitary surveys, are used as guides in pollution control programs as related to bathing waters.

Available data indicate there is considerable need for the expansion of present facilities, improvement of operation for many municipal sewage treatment plants, and for new plant construction. An index of the need for expansion of present treatment works is gained from the average age of existing facilities. Sewage treatment plants in the Minnesota section

Table 10. Big Sioux River Basin - Needs for municipal and industrial waste treatment plants

Needs	Municipal		Industrial
	Number	Population served by facilities	Number
New plant	8*	20,500	2
Enlargement or additions to existing plant	10	68,300	1
Replace existing plant	2	1,800	0
No project required	16	11,900	4

*Includes 2 where plants have been previously installed but which must be completely new, therefore the State considers them to be new plants needed rather than replacements.

Table 11. Big Sioux River Basin - Current status of municipal and industrial action on pollution abatement needs

Status of project	Number of municipalities	Number of industries
No action	12	0
Abatement ordered	0	0
Planning initiated	5	0
Final plans approved	3	2
Construction awaiting financing	0	0
Under construction	0	0
Status undetermined	0	1

average 27 years; those in the Iowa section 25 years; and South Dakota plants average 15 years. Many of the cities in which plants were installed 20 or 30 years ago have outgrown the plant capacity. Only 16 of the 30 plants are now considered to be adequate from a capacity viewpoint.

Table 10 summarizes project needs of Basin municipalities and industries discharging wastes through privately owned outlets. Table 11 indicates the progress of municipalities and industries toward solution of pollution problems.

The cost of adequate sewage treatment facilities, including original construction, operation, and maintenance has been estimated to be between $9 and $15 per year per family, depending largely upon the size of the community and the degree of treatment required. Family costs are usually lower as the size of the community increases. The cost of constructing adequate treatment facilities for all wastes originating in the Big Sioux Basin is conservatively estimated to approximate $2,500,000.

In addition to construction needs, intensification of state water pollution control educational programs is important to long range planning and aggressive administration by pollution control agencies. The adverse effects of pollution on public health and water conservation must be presented to the public if its support of water pollution control measures is to be forthcoming.

Operators of sewage treatment plants must be provided adequate training through dissemination of information concerning treatment methods. Municipal officials must be alerted to pending sewage treatment needs so that improvements are planned well in advance of actual needs.

A brief summary of the status of sewage treatment at those sources of pollution where new plants or improvements have been recommended are presented.

1. Webster, South Dakota

The South Dakota State Department of Health recommends that the present sewage treatment facilities be enlarged sufficiently to provide adequate treatment. The area about Webster does not have a definite drainage pattern, however pollution of local ponds and sloughs is a considerable nuisance and should be properly controlled. Preliminary planning for enlargement of the sewage treatment facility is under way.

2. Watertown, South Dakota

Additional sewage from an expanding population and increased industrial activity has overloaded the present sewage treatment works so that during low stream discharges nuisance conditions exist immediately below the city. Such conditions are usually at their worst during the winter season under heavy ice formation. It is necessary, therefore, that Watertown enlarge the existing treatment works sufficiently to comply with the standards of the South Dakota State Department of Health.

The Watertown abattoir, presently discharging untreated waste from its slaughtering operation, contributes considerably to the pollutional

problem in the Big Sioux River below Watertown. The installation of a treatment plant for which plans have been prepared will improve sanitation of the stream.

3. Clear Lake, South Dakota

Clear Lake has sewage treatment facilities, but treatment provided has been insufficient to control pollution in the very small receiving stream; as a result nuisance conditions have existed below the present plant outlet. The South Dakota Department of Health has recommended that additional treatment units be provided, and plans for the additions have been approved.

4. Brookings, South Dakota

The small tributary stream of the Big Sioux River which receives effluent from the Brookings plant is quite badly polluted during periods of critical low flow. The treatment works at Brookings should be rebuilt. The South Dakota State Department of Health has indicated that an entirely new plant is necessary.

5. Madison, South Dakota

The sewage plant at Madison is not sufficient to adequately treat the wastes contributed. The effluent of the treatment plant is discharged to a small lake which during short periods of high runoff contributes to the Big Sioux River via Skunk Creek. A rather high degree of treatment is indicated at Madison in order to maintain the receiving body of water in good condition. An entirely new plant is considered necessary by the South Dakota State Department of Health.

6. Sioux Falls, South Dakota

The City of Sioux Falls is enlarging the existing sewage treatment works. The very high degree of efficiency maintained in this plant makes it a difficult and costly matter to further reduce the strength of waste discharged to the river. Waste tributary to the municipal sewer system is equivalent to that from approximately 311,000 people. Present methods of treatment remove approximately 95 percent of the polluting material. The amount remaining is sufficient, however, to materially affect the sanitation of the stream below Sioux Falls during periods of low river discharges. Plans for additional treatment units at the Sioux Falls Rendering Company, which has a private waste outlet into the Big Sioux River, have been approved by the South Dakota State Department of Health. Construction of this latter improvement will help to improve present river conditions.

7. Canton, South Dakota

Canton should construct a sewage treatment plant as recommended by the South Dakota State Department of Health. Sewage is being discharged untreated into the Big Sioux River. It is probable that pollution thus contributed adversely affects water uses in the State of Iowa.

8. Rock Rapids, Iowa

Rock Rapids should install sewage treatment facilities in accordance with recommendations made by the Iowa State Department of Health. Nuisance conditions have been reported in the Rock River below the sewer outfall.

9. Ashton, Iowa

Sewage treatment facilities should be provided at Ashton in accordance with plans and specifications approved by the Iowa State Department of Health.

10. Sibley, Iowa

Plans for enlarging the existing plant at Sibley have been approved by the Iowa State Department of Health. This improvement should be completed.

11. George, Iowa

River conditions below George have been reported to be quite poor during periods of critical flow in the Little Rock River. The town has a treatment plant which was originally constructed in 1917 and has given good service until recent years. Plans have been approved by the Iowa State Department of Health for replacing the present obsolete plant with a new one. This improvement should be completed.

12. Doon, Iowa

Conditions in the Rock River below Doon warrant installation of secondary treatment facilities. The present plant, an Imhoff tank, is unable to reduce the strength of the waste to a point where it can be discharged to the river during periods of low flow without causing unsanitary stream conditions. Biological or secondary treatment as specified by the State Department of Health should be incorporated into the treatment works.

13. Rock Valley, Iowa

The sewage treatment plant at Rock Valley has become obsolete through age and overloading. Great difficulty has been experienced in attempting to operate sand filters during the winter months. Plans for construction of a trickling filter to replace the present plant have been approved by the Iowa State Department of Health, and construction should be undertaken.

14. Hull, Iowa

Sewage treatment facilities provided at Hull have become obsolete through age and are no longer capable of producing the treatment necessary to control pollution in the small receiving stream. The Iowa State Department of Health recommends that the present installation be replaced by a modern plant of adequate design. The city has engaged an engineer to prepare plans of the recommended project.

15. Hawarden, Iowa

Hawarden discharges raw sewage into the main stem of the Big Sioux River. Since the State Department of Health has not had authority until July 1, 1951, to investigate border streams, there are very little data on actual stream conditions. It is known, however, that unsatisfactory conditions develop during periods of low flow. Experience indicates that during critical periods, formation of sludge banks will occur together with attending nuisances and odors. It is probable that this pollution adversely affects water uses in the State of South Dakota. Recommendations for treatment were made in the 1937 Iowa Planning Board report. This project should be undertaken.

16. Akron, Iowa

Akron, located downstream from the City of Hawarden, also discharges raw sewage into the main stem of the river. Recent factual data are lacking on condition of the river for the same reason as stated in the preceding paragraph. It is probable, however, that this pollution adversely affects water uses in the State of South Dakota. Primary, and possibly secondary, treatment is essential for maintenance of satisfactory conditions in the river for its many uses below Akron. Action towards plant construction should be initiated.

17. Lake Benton, Minnesota

The original sewage plant consisting of primary treatment was constructed in 1920. Since that time the loading has increased necessitating installation of secondary treatment facilities if Flandreau Creek is to remain in good condition during periods of low stream discharge. This improvement should be undertaken.

18. Jasper, Minnesota

Jasper does not have a municipal sewer system, however the local creamery and locker plant operations contribute considerable pollution to Split Rock Creek. Adequate control of this pollution through salvage or treatment is recommended.

19. Pipestone, Minnesota

The sewage treatment plant at Pipestone is overloaded to the extent that conditions in Pipestone Creek deteriorate badly during low flow periods. Enlargement of the plant is necessary to improve quality of the effluent and should be undertaken.

20. Adrian, Minnesota

The small stream into which the present sewage plant discharges settled sewage is unable to assimilate the residual pollution. Secondary treatment is necessary to produce an acceptable effluent and should be provided.

21. Luverne, Minnesota

The City of Luverne has never had a sewage treatment works, and is at the present time discharging raw sewage into the Rock River. The pollution is great enough to create a serious condition in the river which extends into the State of Iowa. Treatment facilities should be provided at Luverne to adequately treat the wastes.

APPENDIX A

Table 12. Big Sioux River Basin - Frequency of low mean monthly discharges*

Years of record	Stream and location	Miles to mouth: Big Sioux River	Miles to mouth: Tributary	Drainage area, square miles	Minimum monthly mean flows in cubic feet per second that may be expected once in: 2 years	3 years	5 years	10 years	Minimum
				SUMMER PERIOD (JUNE-SEPT)					
12	Big Sioux River Akron, Iowa	94.0		8,851	100	85	58	50	39
4	Rock River Luverne, Minn.	84.7	70.0	440	14.5	12.6	11.5	11	11
6	Big Sioux River Sioux Falls, S.D.	161.0		6,200	125	60	20	9	9
3	Big Sioux River Watertown, S.D.	362.8		1,053	4	2.5	1.6	1	1
				WINTER PERIOD (DEC-FEB)					
12	Big Sioux River Akron, Iowa	94.0		8,851	77	63	50	38	12
3	Rock River Luverne, Minn.	84.7	70.0	440	8	5	3.7	2	2
3	Big Sioux River Sioux Falls, S.D.	161.0		6,200	33.0	25.0	19.0	16.9	16.9
3	Big Sioux River Watertown, S.D.	362.8		1,053	4.0	2.3	0.8	0	0

*Flow records at Watertown, South Dakota, were assembled over the period 1900 to 1908, and 1935 to 1946. Summer records for 1901, 1902, and 1940 are reliable inasmuch as they were taken for the entire period, June to September, inclusive. For the water year 1903, recordings were taken for approximately two weeks in each month. Winter records are not as complete. In 1901, mean flows are provided for January and February. In water year 1902, six days of reading constitutes the winter record. No winter flows are available for water year 1903.

At Sioux Falls, South Dakota, early records did not include winter readings. While summer readings have some gaps, the information in general seems reliable. The gauging station at Sioux Falls is below the sewer outlet, and includes sewage flow estimated to be about 7 c.f.s. In periods of low flow, this increase in water available for dilution of treated sewage is extremely important, and stream flow readings are quite misleading. Stream flow records at Akron, Iowa, are for a longer period of time and include much of the drought period. This record is considered entirely adequate.

For the Rock River at Luverne, Minnesota, the period of record is from 1912 to 1914. Summer flows encompass the season, June to September, inclusive, each year. However, only one month of record is available for the winter portion of the water year 1913. All data on stream discharges obtained from the Publications of the U. S. Geological Survey.

APPENDIX B

REVIEW OF STATE LAWS PERTAINING TO WATER POLLUTION CONTROL

IOWA

I. General Statement

Iowa has a water pollution control act with principal authority vested in the State Department of Health. It is doubtful whether the act could be termed "comprehensive." The State Board of Health, the Iowa National Resources Council, and the State Geologist also have certain functions relating to control of water pollution. The act was last amended in 1951.

The Surgeon General has designated the State Department of Health as the State water pollution agency pursuant to the Federal Water Pollution Control Act.

Iowa statutes relating to water pollution are found in Code of 1946, sec. 84.1; Code of 1946, c. 135, as amended by Acts of 53d G.A., c. 79; Code of 1946, c. 136; Code of 1946, sec. 469.1 to 469.8, as amended by Acts of 53d G.A., c. 203; Code of 1946, c. 657 and sec. 732.3; Acts of 53d G.A., c. 203, sec. 18. The water pollution control act is set forth in Acts of 53d G.A., c. 79.

II. Administrative Organization

The State Department of Health is under the supervision of the Commissioner of Public Health, who is appointed for a four-year term by the Governor with the approval of two-thirds of the members of the Senate. The Commissioner is required to be a physician specially trained in public hygiene and sanitation. He is authorized to hire such assistants and employees as may be authorized by law and to assign them their duties. He is authorized to maintain certain named divisions in the Department, together with such others as may be necessary. Code of 1946, c. 135.

The State Board of Health acts in an advisory capacity to the State Department of Health on water pollution control and other matters. The Board consists of the Commissioner of Public Health, the members of the executive council, and five health officers appointed by the Governor. It meets semi-annually on the second Tuesdays of January and July and at such special times as the Governor or Commissioner may designate. The Board elects its own president who serves for a term of one year. Members receive no compensation, but only traveling expenses. Code of 1946, c. 136. The executive council is composed of the Governor, Secretary of State, Auditor of State, Treasurer of State, and the Secretary of Agriculture. Code of 1946, sec. 10.1.

The Natural Resources Council is composed of seven members appointed by the Governor with the approval of two-thirds of the members of the Senate. Each member who is not a public employee receives $25. a day for time actually spent in discharging his duties. The executive

officer is the Director, who is chosen by the Council. The Director, with the approval of the Council, is authorized to hire assistants and other employees. The duties of the Council pertain principally to flood control. Acts of 53d G.A., c. 203.

The State Geologist, who is in charge of the Geological Survey, is appointed by the Geological Board which consists of the Governor, the Auditor of State, and the presidents of the Agricultural College, the State University, and the Iowa Academy of Science. Code of 1946, c. 305.

III. Powers and Duties

A. State Department of Public Health

1. Development of Comprehensive Program. There is no specific statutory authority granted the Department to develop a comprehensive program, to set standards of water purity, or to classify water. Such authority would seem to be implied, however, from the Department's powers (1) to exercise general supervision over the public health, promote public hygiene and sanitation (Code of 1946, sec. 35.11(1); (2) to investigate and prevent water pollution (Code of 1946, sec. 135.18 to 135.29, as amended (Acts of 53d G.A., c. 79)); and (3) to make rules (Code of 1946, sec. 135.11(17)). Also certain duties of the Natural Resources Council are delegated to it. See IIIB, infra.

2. Issuance of Permits and Review of Plans and Specifications. A new sewerage system may not be installed or an existing one extended or otherwise altered without a written permit from the Department. Before a permit will be issued, plans and specifications must be submitted. The installation or alterations must be in accordance with the submitted plans. These requirements are also applicable to extensions or additions to factories or other business enterprises which would substantially increase water pollution. The Department may require submission of plans and specifications of existing sewerage systems. (Acts of 53d G.A., c. 79, par. 13 to 17.)

The Iowa Natural Resources Council may not issue a permit to build a dam if the use to which the water will be put will cause pollution. The Council may not issue a permit without a certificate of approval from the Department. No dam may be constructed without issuance of the proper permit. Code of 1946, sec. 469.1 to 469.9 as amended by Acts of 53d G.A., c. 203.

3. Enforcement. The Department may make investigations of water pollution on its own initiative or on the complaint of others.

If the investigation reveals that pollution exists, a public hearing with notice to the alleged polluters is held. After the hearing the Department may order the guilty parties to discontinue the pollution. No order shall be issued without the written approval of a majority of the members of the Iowa Natural Resources Council. An appeal from the order lies to the district court where the trial is de novo, and without a jury. Acts of 53d G.A., c. 79, par. 2-10.

The orders of the Department are enforced by contempt proceedings. The penalty is a fine of not more than $1,000. Acts of 53d G.A., c. 79, par. 11 and 12.

The pollution of a river, stream, or pond is declared by law to be a public nuisance. The penalty is a fine of not more than $1,000, or a jail sentence of not more than one year. The court may also order the nuisance abated. Laws of 1946, c. 657.

The throwing of dead animals, night soil, or garbage into a stream, pond, well, or spring is a crime punishable by a maximum fine of $100, or by imprisonment for not more than 30 days. Code of 1946, sec. 732.3.

4. Conduct of Studies, Investigations and Research. The Department's express authority in this field is limited to surveys of particular streams or bodies of water with a view to eliminating particular sources of pollution. Acts of 53d G.A., c. 79, par. 1. For the duties of the Natural Resources Council in this respect, see III B, infra.

5. Cooperation with Other Public and Private Agencies. The Department is given no express authority to secure to the State the benefits of the Federal Water Pollution Control Act. It is authorized to accept financial aid from the United States for the purpose of assisting in carrying on the State's public health work. Code of 1946, sec. 135.39. There is no express authority for the Department to enter into interstate agreements.

6. Administrative Powers. The Department has no express power to hold hearings except in connection with particular sources of pollution. See III A 3 above. It is given no express power to issue subpoenas, administer oaths, or to pay witnesses.

It has the general power to establish, publish, and enforce rules necessary for the discharge of its duties. Code of 1946, sec. 135.11 (17). It has specific authority to adopt and enforce rules with reference to submission of plans and specifications of sewerage systems. Acts of 53d G.A., c. 79, par. 17.

B. Iowa Natural Resources Council.

The Council is directed by statute to make surveys and investigations of health problems and of stream pollution as they relate to flood control and water resources. The Council is also directed to formulate plans and recommendations for the protection and preservation of the water resources of the State. Acts of 53d G.A., c. 203, par. 18. For other duties of the Council with reference to water pollution, see III A 2 and III A 3 above. In practice the Department of Health seems to discharge most of the Council's water pollution control duties.

C. State Geologist.

Where a well is drilled for oil or gas, proper precautions must be taken to prevent the pollution of all water within 300 feet of the surface. Within 60 days after the completion of the well a report

must be filed with the State Geologist showing a complete record of the precautions taken. Code of 1946, sec. 84.1.

IV. Exemption from Operation of the Act

None.

V. Preservation of Existing Rights and Remedies

The penalty provided in Acts of 53d G.A., c. 79, par. 12, is in addition to any others provided by law including the public nuisance provisions. See III A 3, above.

VI. Statement of Policy, Severability Clause, etc.

The act contains no statement of policy or severability clause.

VII. Interstate Agencies

The Department of Health participates in the following interstate agencies.

1. The Upper Mississippi River Sanitary Board. The other participating States are Minnesota, Wisconsin, Illinois, and Missouri. Among other things the Board has made malaria surveys and sponsored research in the field of sewerage treatment.

2. The Missouri River Basin Health Council, which includes the States within the area of the Missouri Drainage Basin Office. The other States are Nebraska, Montana, North Dakota, South Dakota, Wyoming, Minnesota, Colorado, Kansas, and Missouri.

The Department of Health has also entered into a cooperative agreement, together with the Water Pollution Control Agencies of the States of South Dakota, Nebraska, Kansas, and Missouri, governing the conduct of a comprehensive investigation of water pollution of the Lower Missouri River, Yankton, South Dakota, to the confluence with the Mississippi River near St. Louis, Missouri. This participation was approved by the State Attorney General due to the fact that the study was initiated by the Public Health Service through its Missouri Drainage Basin Office.

REVIEW OF STATE LAWS PERTAINING TO WATER POLLUTION CONTROL

MINNESOTA

1. General Statement

In 1945 Minnesota enacted a comprehensive State Water Pollution Control Act with authority vested in a Water Pollution Control Commission. The State Board of Health also has certain water pollution control functions relating to public health and sources of water supply for domestic use. Statutory authority of the Board of Health relating to water pollution has existed for more than 65 years and was last amended in 1945.

As the Water Pollution Control Commission has been given the power and duty of administering all laws relating to the pollution of any waters of the State, the Surgeon General has designated it as the State water pollution agency pursuant to the Federal Water Pollution Control Act.

Minnesota statutes relating to water pollution are found in Minn. Stat. Ann. 144.35-144.38.

II. Administrative Organization

An independent Water Pollution Control Commission consisting of the Secretary and Executive Officer of the State Board of Health, the Commissioner of Conservation, the Commissioner of Agriculture, Dairy and Food; the Secretary and Executive Officer of the State Livestock Sanitary Board and a member at large who shall be appointed by the Governor and shall hold office for four years and until his successor shall have been appointed and qualified, (Minn. Stat. Ann. 144.372) has the power and duty to administer and enforce all laws relating to the pollution of any waters of the State. (Minn. Stat. Ann. 144.373). Although the Water Pollution Control Commission has comprehensive power to enforce the water pollution control laws of the State, the State Board of Health is given the power and duty of administering all laws relating to the pollution of any waters of the State, so far as such pollution affects the public health. (Minn. Stat. Ann. 144.38).

The Secretary and Executive Officer of the State Board of Health serves as Secretary of the Commission (Minn. Stat. Ann. 144.372). Aside from the designation of hearing and investigating officials (Minn. Stat. Ann. 144.373(10)) there is no statutory provision for delegation of authority by members of the Commission nor is an advisory council provided for by statute. But the State Board of Health has the statutory duty of furnishing the Commission with the employment of a qualified and experienced sanitary engineer to act as consultant to the Commission (Minn. Stat. Ann. 144.38(2)).

III. Powers and Duties

1. Development of Comprehensive Programs. The Water Pollution Control Commission is not given specific statutory direction to develop a comprehensive program. However, the Commission is given the power

and duty to make such administrative classification of the waters of the State as it may deem advisable (Minn. Stat. Ann. 144.373(3)), and establish reasonable pollution standards of the waters of the State in relation to the public use to which they are or may be put (Minn. Stat. Ann. 144.373(4)).

2. Issuance of Permits and Review of Plans and Specifications. The Commission has the power and duty: to require submission for its approval of plans for disposal systems or any part thereof and to inspect the construction for compliance with the approved plans (Minn. Stat. Ann. 144.373(7)); to issue, continue in effect, or deny permits for the discharge of sewage, industrial waste, or other wastes, or for the installation or operation of disposal systems or parts thereof (Minn. Stat. Ann. 144.373(7)); and to revoke or modify any permit whenever it is necessary, in the opinion of the Commission, to prevent or abate pollution of any waters of the State (Minn. Stat. Ann. 144.373 (8)).

3. Enforcement. The Commission is authorized to issue orders after a hearing before itself or its authorized officer, member, or agent. Any person who will be directly affected by a final order of the Commission is required to be given written notice in person or by registered mail not less than ten days before the date of the hearing, specifying the time and place of the hearing. And such person has the right to be heard at the hearing and to submit evidence thereat (Minn. Stat. Ann. 144.375).

An appeal may be taken from an order of the Commission to the District Court of Ramsey County. The court of its own motion or on application of any party may, in its discretion, take additional evidence on any issue of fact or may try any or all such issues de novo, but no jury trial may be had (Minn. Stat. Ann. 144.375).

Pollution of any waters in violation of any order of the Commission constitutes a public nuisance and may be enjoined and abated as such (Minn. Stat. Ann. 144.377).

Violation of any provision of the State Water Pollution Control Act or of any regulation adopted by the Commission thereunder is a misdemeanor (Minn. Stat. Ann. 144.377(6)) punishable by imprisonment in the county jail for not more than three months, or by a fine of not more than $100 (Minn. Stat. Ann. 610.19).

The Commission, when it has determined that an emergency exists respecting any matter affecting the public health, may make a final order without notice and without a hearing.

But in addition to the Commission's enforcement powers, the State Board of Health has general charge of all springs, wells, ponds, and streams used as a source of water supply for domestic use and is under the duty to take all necessary and proper steps to preserve the same from such pollution as may endanger the public health. In case of violation the Board may with or without a hearing order any person to desist from causing such pollution and to comply with such direction of the Board as it may deem proper and expedient in the premises (Minn. Stat. Ann. 144.35).

4. Conduct of Studies, Investigations and Research. The State Water Pollution Control Commission is given the power and duty to investigate the extent, character, and effect of the pollution of the waters of the State and to gather data and information necessary or desirable in the administration or enforcement of pollution laws. (Minn. Stat. Ann. 144.373(3)). Further, the State Board of Health is given the duty of making such investigations of water pollution as may be required by the Water Pollution Control Commission (Minn. Stat. Ann. 144.38(2)).

5. Cooperation with other Public and Private Agencies. The Commission, so far as it is not inconsistent with its duties under the laws of the State, may assist and cooperate with any agency of another State or the United States, or of the Dominion of Canada or any province thereof, in any manner relating to water pollution control (Minn. Stat. Ann. 144.376(1)). The Commission may receive and accept money, property, or services from any person or from any agency or from any other source for any water pollution control purpose within the scope of its functions (Minn. Stat. Ann. 144.376(2)).

However, the State Board of Health is specifically authorized to cooperate with other departments of the State, other State offices, municipalities of all kinds, other States, the United States, the Dominion of Canada, or any province thereof, industries, societies, corporations, and individuals, to the end and purpose of protecting and freeing the waters of the State from pollution (Minn. Stat. Ann. 144.38(3)).

6. Administrative Powers. The Commission is given the power and duty to conduct investigations and hold such hearings as it may deem advisable and necessary for the discharge of its duties under the State Water Pollution Control Act; and to authorize any member, employee, or agent appointed by it to conduct such investigations or hold such hearings.

In any such hearing or investigation any member of the Commission or any employee or agent authorized by the Commission may administer oaths, examine witnesses, and issue in the name of the Commission subpoenas requiring the attendance and testimony of witnesses and the production of evidence relevant to any matter involved in any such hearing or investigation. Witnesses receive the same fees and mileage as in civil actions. In case of contumacy or refusal to obey a subpoena, the district court of the county where the proceeding is pending, or in which the person guilty of such contumacy or refusal to obey is found or resides, has jurisdiction upon application of the Commission or its authorized member, employee, or agent to issue to such person an order requiring him to appear and testify or produce evidence. Any failure to obey such order of the court may be punished as contempt by the court (Minn. Stat. Ann. 144.373(10)).

Any person operating a disposal system when requested by the Commission must furnish to it any relevant information. The Commission or any employee or agent thereof when authorized by it may examine any books, papers, records, or memoranda pertaining to the operation of the disposal system. Whenever it is necessary for the purposes of the State Water Pollution Control Act, the Commission or any member, employee, or agent thereof when authorized by it may enter upon any property, public or private, for the purpose of obtaining information or conducting surveys or investigations (Minn. Stat. Ann. 144.374).

A person must obtain a written permit for the construction, installation, and operation of any disposal system by submitting plans to the Commission for their approval (Minn. Stat. Ann. 144.377).

The Commission may prescribe and alter rules and regulations for the conduct of its operations and other matters within the scope of the powers under the State Water Pollution Control Act, provided that every rule or regulation affecting any other department or agency of the State or any person other than a member or employee of the Commission is filed with the Secretary of State (Minn. Stat. Ann. 144.373(9).

The Commission may not issue a final order, except in case of emergencies, until due notice and hearing are given to the parties affected (Minn. Stat. Ann. 144.375).

The Commission is not required to hold hearings, unless it so desires, before issuing regulations or granting permits.

IV. Exemptions from Operation of Act

There are no geographical or functional exemptions from the operation of the State Water Pollution Control Act.

V. Preservation of Existing Rights and Remedies

The State Water Pollution Control Act may not be construed as repealing any provisions of law relating to the pollution of any waters of the State, but is required to be construed as supplementing the same and, in addition to the laws now in force, except as the same may be in direct conflict therewith (Minn. Stat. Ann. 144.378).

VI. Statement of Policy, Severability Clause, etc.

The State Water Pollution Control Act does not contain a statement of policy nor a severability clause.

VII. Interstate Agencies

Minnesota, together with South Dakota and North Dakota comprise the Tri-State Waters Commission which is a corporate body which, among other things, was created for the purpose of studying problems concerning the pollution of water supplies in the interstate drainage basin area of the member States and recommending uniform legislation to the States involved for the control of such pollution. The Commission is authorized to review and approve plans for all waste disposal works on certain specified waters in the interstate drainage basin area (Approved by Congress April 2, 1938; 52 Stat. 150).

Representatives of Minnesota also have taken part in the Missouri River Basin Agreement with representatives of Colorado, Kansas, Missouri, Iowa, Montana, North Dakota, South Dakota and Wyoming; the Great Lakes River Basin Agreement with representatives of Wisconsin, Illinois, Indiana, Michigan, Ohio, Pennsylvania and New York; the Upper Mississippi River Basin Drainage Agreement with representatives of Iowa, Wisconsin, Illinois, and Missouri. These are informal arrangements and do not constitute "interstate agencies" as defined in the Federal Act.

REVIEW OF STATE LAWS PERTAINING TO WATER POLLUTION CONTROL

SOUTH DAKOTA

Committee on Water Pollution

The South Dakota Code provides for a committee on water pollution[1] consisting of the Superintendent of the State Department of Health, the State Engineer, and the Director of Game and Fish.

The members of the committee, who shall serve without salary, shall meet at the call of the chairman to conduct hearings and other such business as may come before them. Except as otherwise specifically provided, all technical work relating to water pollution shall be done under the direction of the Director of the Division of Sanitary Engineering of the State Department of Health.

It shall be the duty of the committee to classify the public waters of the State into Class A waters and Class B waters. Class A waters are those waters in which pollution or corruption entering such waters can be so controlled that the waters receiving such pollution and corruption shall not be unwholesome or unfit for domestic use, or unsafe as a source of public water supply, or deleterious to plant or fish life, or shall not cause a public nuisance. Class B waters are those waters which are more important to the welfare of the people of the State as carriers of wastes, provided such wastes are not detrimental to the public health. No new discharge which causes any new pollution or corruption in the form of sewage, industrial, or other wastes, liquid or solid, without first having been given a permit by the water pollution committee in Class A waters shall be allowed. The committee may investigate alleged pollution or corruption of any Class A waters rendering such waters unwholesome or unfit for domestic use, or unsafe as a source of public water supply, or delsterious to plant or fish life, or which causes a public nuisance. Such investigations shall be made upon the written petition of the governing body of any municipality, or any city or county board of health, or 100 electors of the State. The Director of Sanitary Engineering at the direction of the committee shall make investigations including chemical and bacteriological analysis and submit reports to the committee covering such investigations. The committee may order the cessation of pollution after hearing if, in its judgment, the public welfare warrants it, and may make an interim order directing an offender within a specified time to refrain from doing the thing found to be the cause of such pollution. The committee shall keep a complete record of its proceedings which shall be enforced by the circuit court of the county where the pollution occurs. An appeal may be taken from any order or decision of the committee to the circuit court of the county where the pollution occurs.

State Department of Health

The State Department of Health is authorized to adopt and enforce orders, directions, or regulations as may be designated to protect the

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[1] Provisions relating to the committee on water pollution are found in section 61.0106 to 61.0116, South Dakota Code of 1939.

public health in (1) the disposal of sewage, and (2) the pollution of streams and other waters[2]. The State Department of Health by regulation requires approval by it of the plans of any disposal system before such construction may take place.

* * * * * *

While it appears that the committee on water pollution has comprehensive authority for enforcing the State's pollution abatement laws, authority in this field is also provided for and exercised by the State Department of Health. Any revision of the South Dakota statutes should take into account the possibility of eliminating this overlapping.

The powers of investigation and granting of permits by the committee on water pollution are specifically directed in a large measure toward "Class A" waters. Such powers should be applicable to all the waters of the State. The committee does not appear to have the statutory right to issue summary orders in the case of emergencies. A fine and/or imprisonment is not provided for by statute for the violation of any of the orders of the Committee. The committee is not given statutory direction to develop comprehensive programs to prevent, abate, and control water pollution and to look toward interstate, Federal, and local cooperation wherever possible to achieve these ends. The present statutes do not seem to consider all legitimate uses of waters such as recreational and industrial uses.

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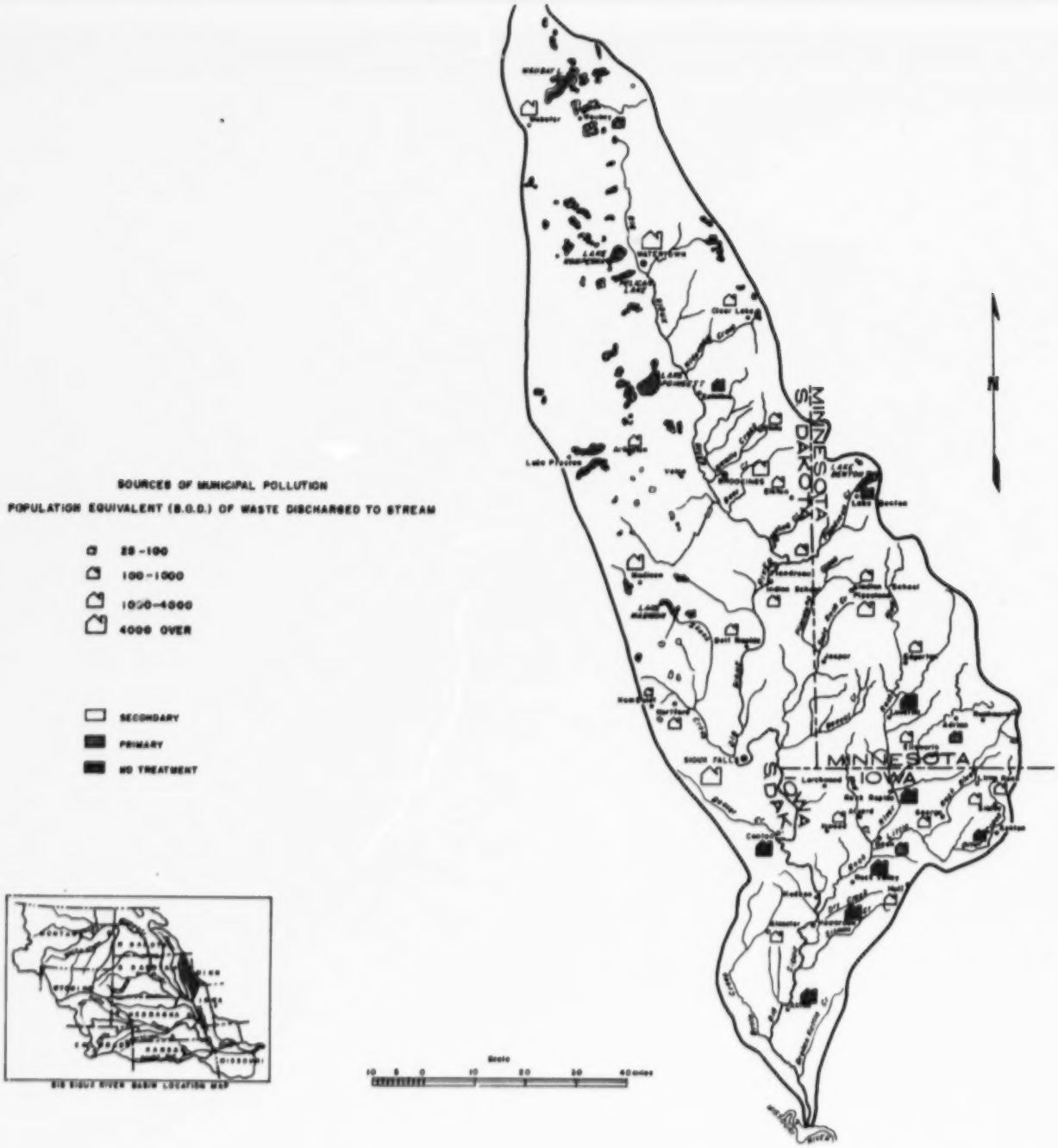
[2]Section 27.0104, South Dakota Code of 1939.



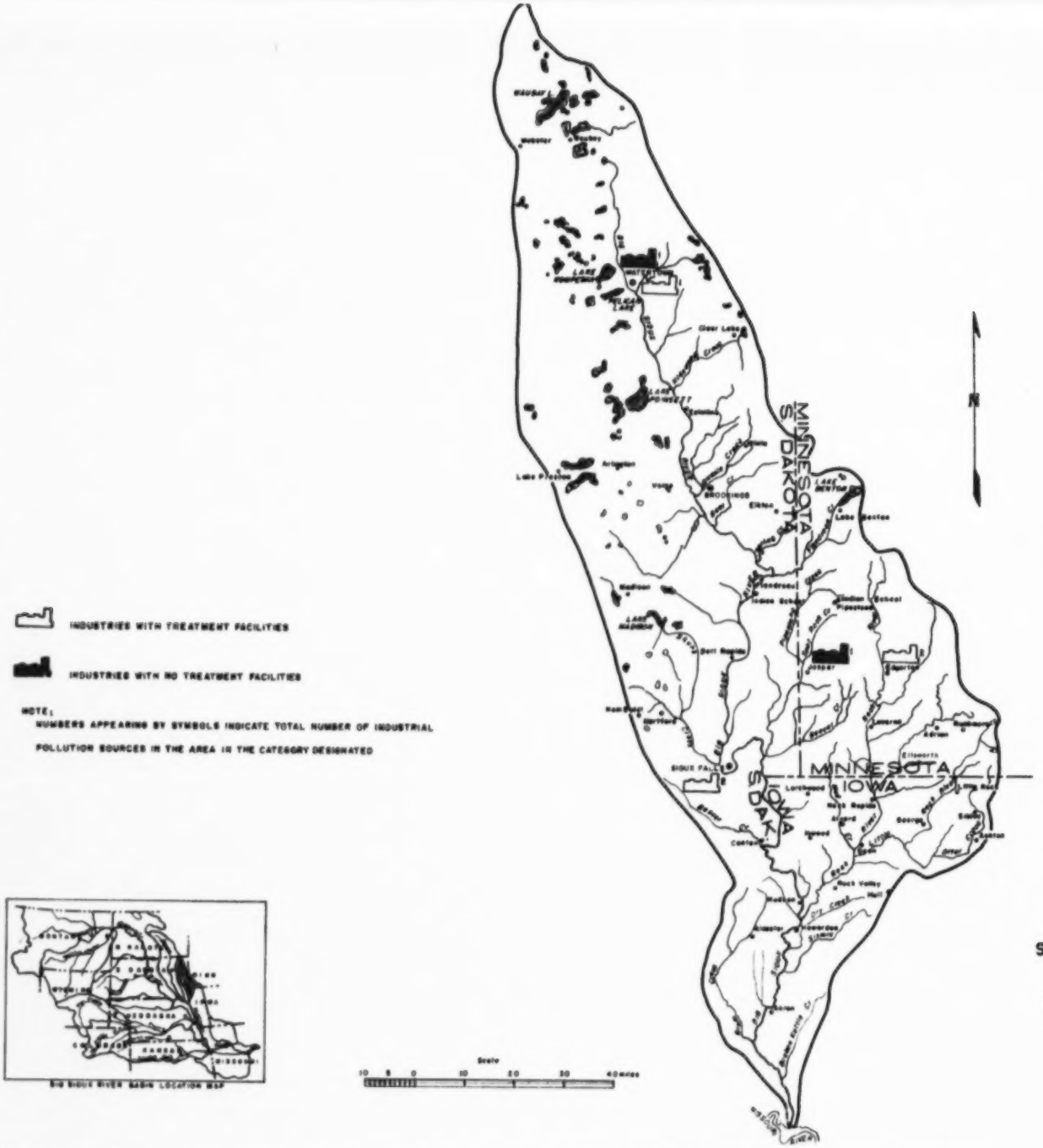
BIG SIOUX RIVER BASIN

SOURCES OF MUNICIPAL POLLUTION

AND

EXISTING TREATMENT FACILITIES

FEDERAL SECURITY AGENCY
Public Health Service
DIVISION OF WATER POLLUTION CONTROL
MAP NO. 2



INDUSTRIES WITH TREATMENT FACILITIES

INDUSTRIES WITH NO TREATMENT FACILITIES

NOTE:
NUMBERS APPEARING BY SYMBOLS INDICATE TOTAL NUMBER OF INDUSTRIAL POLLUTION SOURCES IN THE AREA IN THE CATEGORY DESIGNATED

Big Sioux River Basin Location Map

BIG SIOUX RIVER BASIN

SOURCES OF INDUSTRIAL POLLUTION
AND
EXISTING TREATMENT FACILITIES

FEDERAL SECURITY AGENCY
Public Health Service
DIVISION OF WATER POLLUTION CONTROL
MAP NO. 3

MUNICIPAL WASTE TREATMENT PLANTS

PLANT REQUIREMENTS INDICATED BY LETTERS APPEARING BELOW SYMBOLS, AS FOLLOWS:

A - NEW PLANT

B - ENLARGEMENT OR ADDITIONS

C - REPLACE EXISTING PLANT

BIG SIOUX RIVER BASIN

MUNICIPAL WASTE TREATMENT NEEDS

FEDERAL SECURITY AGENCY
Public Health Service
DIVISION OF WATER POLLUTION CONTROL
MAP NO. 4

INDUSTRIAL WASTE TREATMENT PLANTS

PLANT REQUIREMENTS INDICATED BY LETTERS APPEARING BELOW SYMBOLS, AS FOLLOWS:

A-NEW PLANT

B-ENLARGEMENT OR ADDITIONS TO EXISTING PLANT

NOTE:

NUMBERS APPEARING NEXT TO CODE LETTERS REPRESENT NUMBERS OF PLANT REQUIREMENTS IN THE CATEGORY DESIGNATED

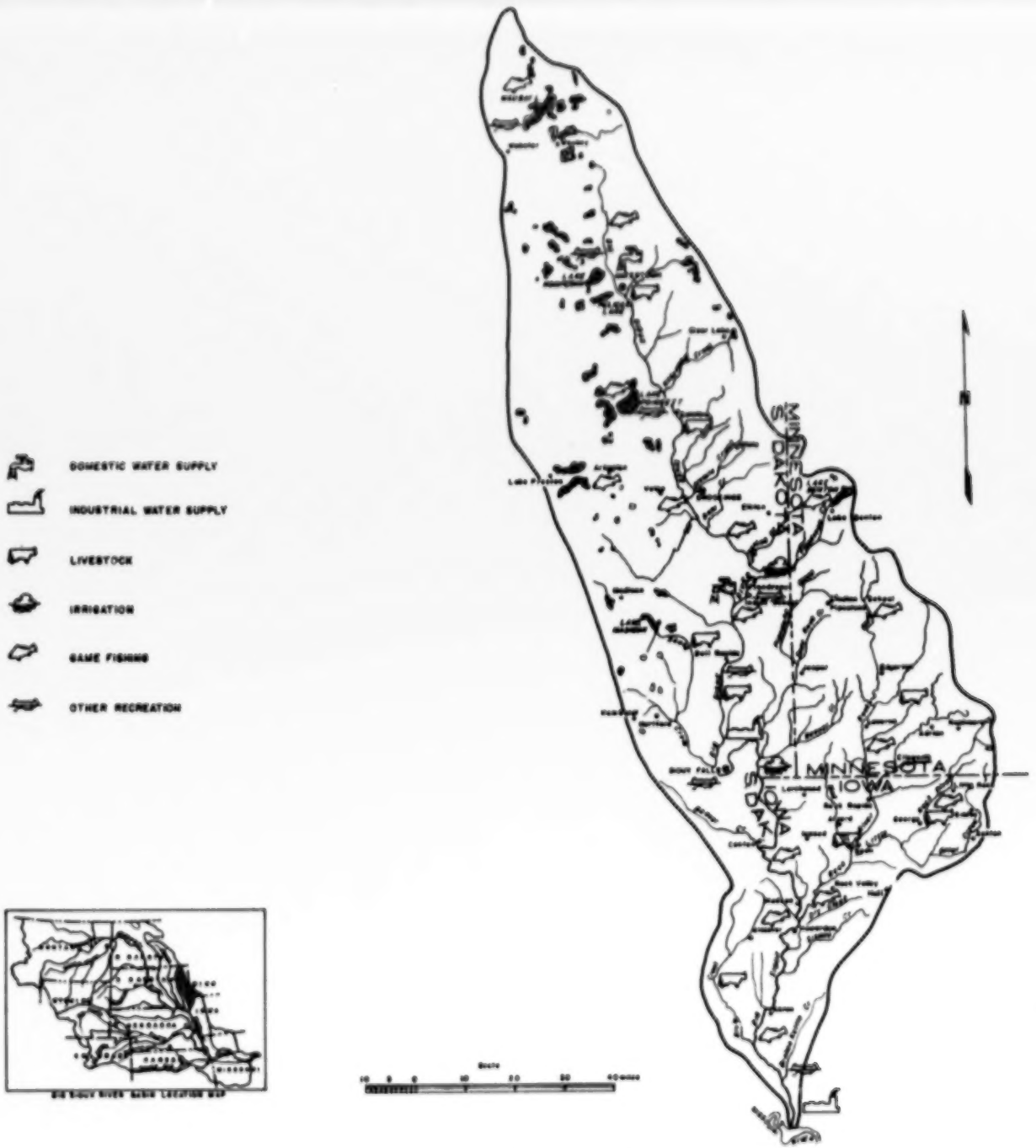
BIG SIOUX RIVER BASIN LOCATION MAP

Scale

BIG SIOUX RIVER BASIN

INDUSTRIAL POLLUTION ABATEMENT NEEDS

FEDERAL SECURITY AGENCY
Public Health Service
DIVISION OF WATER POLLUTION CONTROL
MAP NO 5



BIG SIOUX RIVER BASIN

EXISTING PRIMARY WATER USES

FEDERAL SECURITY AGENCY
Public Health Service
DIVISION OF WATER POLLUTION CONTROL
MAP NO. 6